Timber flooring installation
Correct practice for solid strip floors

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Learning Objectives
• Participants completing this activity will be able to:
  – Understand the link between moisture control and the installation of timber flooring.
  – Install strip flooring in a range of applications.
  – Specify and control timber strip floor installation.
• For architects - AACA Competencies:
  – Design
  – Documentation

This presentation
• Control of moisture
  – in storage & preparation
• Installation
  – Conventional on joists or battens
  – Overlay
• Finishing

Control of moisture
Detailing around the floor must exclude moisture.
Boards must be protected from moisture and damage.

Timber and moisture
• Boards need to be laid at the correct moisture content.
• A moisture content to AS 2796 is generally suitable (9-14% MC).
• Strip flooring will always move slightly between the boards.

Acclimatisation

<table>
<thead>
<tr>
<th>Timber</th>
<th>Service Environment</th>
<th>Response and Required Action</th>
</tr>
</thead>
</table>
| Flooring supplied at a moisture content between 10% and 12% | Moist Conditions
  Average MC – 12.5–16%
  • Cool & damp or hot & very humid | Timber expands
  • Provide extra expansion joints
  • Acclimatise |
| Normal Conditions
  Average MC – 10–12.5% | Timber remains relatively stable. |
| Dry Conditions
  Average MC – 8–10%
  • Air conditioned, centrally heated, or with large northern windows | Timber contracts
  • Acclimatise
  • Consider alternatives to polyurethane finishes |
What affects moisture content

**Drying - Storage**
- Storage in the sun

**Drying - Arrangement**
- Large windows.
- Heaters of all types – fires, heat pumps.
- Air conditioners.
- Warm air moving to upstairs rooms.

**Wetting - Storage**
- Exposed storage
  - Fresh concrete
  - Rain, ripped pack covers

**Wetting - Arrangement**
- Platform floors.
- Wet sub-floors.
- Damp concrete.
- Wet trades.
- Moisture movement in the concrete.

Installing timber strip flooring

Protecting the timber from moisture

- Ideally, the flooring should be stored inside where it is to be laid, or in a similar environment.
- Only install the floor in a fully weatherproofed building.
- Slabs are dry or sealed.

Installing timber strip flooring

Control sources of moisture

- Ensure adequate sub-floor ventilation.
- Provide subsoil drains or swales on the slopes above the house.
- Make sure surrounding gardens & paths are below & fall away from the sub-floor.
- Make broken plumbing or downpipes good immediately.
- Be wary of poor or broken moisture barriers under slabs or missing barriers on slabs.

Installing timber strip flooring

Storage & preparation problems

- Damp sub-floors.
- Uneven joists.
- Wet or fresh concrete.
- Strip flooring as a platform floor.

The effects of poor storage. Delivered at the same time, the left hand board was left in the sun.

Installing timber strip flooring

Installation – strip flooring

Strip flooring as a structural floor

Standard and secret nail profiles

Strip flooring on joists

Installing timber strip flooring
End matched boards

Framing is solid, level, true & dry

- Place a 3 m straight edge along & across the top of joists.
- Variation should not exceed 3 mm.
- Plane proud joists & pack low ones.

Lay boards in straight, parallel lines

- Board should be at least two joist spacings long.
- Ensure all end joints are tightly closed & distributed evenly throughout the floor.

Space butt joints evenly

- Maintain min. 450 mm between butt joints in adjacent rows.
- Ensure joints in adjacent rows of end matched boards do not fall in the same joist spacing.

The right glue and fasteners are essential

- Only use elastomeric glues
- Nail sizes for flooring are specified in AS 1684 Residential timber-framed construction
- Two nails per joist for boards over 85 mm cover.
- Nailing rates for strip flooring to ply sheet are also provided in AS 1684.

<table>
<thead>
<tr>
<th>Nailing</th>
<th>Softwood joists</th>
<th>Hardwood joists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td>65 x 2.8</td>
<td>50 x 2.8</td>
</tr>
<tr>
<td>Machine</td>
<td>65 x 2.5</td>
<td>50 x 2.5</td>
</tr>
</tbody>
</table>

Nailing & pre-drilling

- Keep the nail lines straight & punch them a min. 3 mm below the surface of the boards.
- Depending on the species, end nailing at the butt joint can cause board splitting.
  - If this occurs, pre-drill the nail holes to 80% of the nail diameter.
Provide expansion gaps to AS 1684

- Flooring will expand & contract with moisture changes.
- Install expansion joints:
  - 10 mm gap at every wall plate.
  - Intermediate gaps in floors over 6 m wide.
- Use narrower boards for large areas of floor.

Cramp boards tight

- For top nailed boards, cramp no more than 800 mm width of flooring at a time, closing any gaps.
- There should be full contact between the boards & the frame or substrate.
- For secret nailing, cramp each board tight or use specialist fastening guns.

ANY GLUE USED MUST BE ELASTOMERIC

Installation – overlay

Strip flooring as an overlay on a structural substrate.

Direct stick to concrete

- Work with about 4-6 rows of boards at a time.
- Maintain min. 450 mm staggering between butt joints in adjacent rows.
- Use concrete nails as temporarily fixing at least every 4 boards.
  - Drive them half home at 1200 mm along the board.
- Remove nails after the glue cures.

Overlay on plywood

- Glue and secret nail or staple each board.
- Maintain min. 450 mm staggering between butt joints.

Substrates must be dry

- Supporting slabs should have a moisture content of no more than 5.5%.
- All other substrates must be dry.
- Sealing the slab with a waterproofing compound or membrane may be necessary. This can be a:
  - Sealer coating, or
  - Plastic membrane.
Substrates should be flat

- Slab surfaces should be flat, level & sound.
- The variation from a 3 m. straight edge should not exceed 3 mm, or 2 mm from a 1.5 m edge.
- Existing flooring or sheet floors should be roughly sanded.
- Substrates can be repaired or leveled with:
  - Patching & Leveling compounds.
  - Plywood underlay or battens.

Installation on sheet flooring

- Only specialist elastomeric flooring glues should be used.
- Apply strictly to manufacturer’s recommendations, including details for:
  - Substrate preparation
  - Spreading
  - Pot life

Glues must allow the flooring to move

- Allow 10 mm expansion gaps at all edges.
- Set the first board out straight. Profile if necessary.
- After applying glue, fix the first board.
- Nails ensure the boards remain tight and in firm contact with the adhesive.

Lay boards in straight & parallel lines

Sheet flooring

- Allow 10 mm expansion gaps at all edges.
- Set the first board out straight. Profile if necessary.
- After applying glue, fix the first board.
- Nails ensure the boards remain tight and in firm contact with the adhesive.

Installation on a slab

- Allow 10 mm expansion gaps at all edges.
- Set the first board out straight. Profile if necessary.
- After applying glue, fix the first board.
- Nails ensure the boards remain tight and in firm contact with the adhesive.
Finishing

The quality of the finished timber floor is directly related to the quality of the surface preparation.

Protect the boards

- Prior to sanding and finishing, and during construction.
- Plasterboard setting compounds & other chemicals can stain timber & lead to later discolouration.
- Silicone sealants can affect the bond of the finish.
- Scaffolding, ladders, & dropped tools can dent the timber significantly.

Prepare the floor thoroughly

- Ensure all nails are punched adequately.
- Fill the punched nail holes with a filler compatible with the proposed finish.
- Glue must be allowed to cure – up to 72 hours.
• The floor needs to be sanded to a flat & level surface.
• Deep scratch marks should not be present or accepted.
• Equally, do not expect a “furniture quality” finish on site.

Employ specialist finishing contractors

A furniture grade finish isn’t possible

Select the coating to suit the project.

Moisture curing polyurethanes

Water-based polyurethanes

Modified oil coatings

There are four major classes of finish:
• Moisture curing polyurethanes
• Water-based polyurethanes
• Modified oil coatings
• Oils

• Available as popular single & two pack products.
• They produce a clear, very hard wearing surface in a matt, satin or high gloss finish.
• They darken with age.
• They can also glue the tongue of one board into the groove of the next if applied inappropriately.
  – This causes problems later.

• These finishes also produce a clear, hard wearing surface.
• While more expensive and not as hard, they are becoming more popular as they produce less fumes during application and curing.
• They are trafficable earlier and do not yellow as much.
• They can also stick boards together.

• These are clear varnishes, generally made from a mixture of resin & oil.
• Easy to apply & penetrating, these give a slightly softer look than the polyurethanes but are less hard-wearing.
• They can be recoated in small patches.
• They darken with age.
• A surface polish is recommended in commercial applications to reduce maintenance.
Penetrating oils

• These are penetrating finishes that are generally less hard wearing than the modified oils or polyurethanes.
• They give a soft, natural appearance.
• They require regular maintenance and can lead to mould growth in cold & damp locations.
  — Oil is an excellent food for fungi.

Follow the instructions explicitly

• Many problems with timber floors are due to inappropriate application of the finish.
• Do not thin the finish unnecessarily. &
• Only apply it to a stable & well laid floor.

Summary

• Timber provides an excellent floor
• Like all building elements, they require care and skill to install properly.
  — The timber has to be installed at the correct moisture content. Site moisture has to be controlled.
• Support structures or substrates should be flat, level and not a potential moisture source.
• Clear installation instructions are available for most flooring product types.
• The coating selection is important, especially in rooms with varying moisture content.
• Most flooring problems results from poor moisture control or varying moisture contents.

Problems and probable causes

Area of particular care

• Poor moisture protection of slabs.
• Poor sub-floor ventilation.
• Inadequate expansion gaps.
• The history & position of heaters & AC.
• The effects of large north facing windows.
• Incorrect nailing size and number.
• Inadequate gluing.
• Improper finishing - leading to slabbing.

Peaking: moisture + expansion
Peaking: expansion + crushing

Peaking due to crushing.

An unwise response

Crowning

Mistakes in the construction or penetration through the floor joints result in the moisture content of the lower surface of the floorboard. This causes the board to cup.

Eventually, when the moisture dries, the lower surface of the floorboard shrinks and causes the board to drop.

Peaking and inadequate gluing

Shrinkage in a hot room

Slabbing: adhesion and shrinkage

Causes of problems

- In our experience, problems occur in only a small percentage of floors.
- They rarely have a single cause.
  - A proportion are due to unrealistic expectations.
  - Others are due to changing ambient conditions, such as a new heater or garden, or broken pipes;
  - The remainder result from poor moisture control and inappropriate building practice.